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ROAD TRANSPORT IN AFRICA

A priority programme for the 1990s

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INTRODUCTION

This issue of the Transport Bulletin discusses future developments in land transport in Africa. It comprises three sections:

The first section analyses the current state of road and rail infrastructure and reviews the objectives of current programmes, as well as new priorities and programmes for the 1990s.

The second part describes the Sub-Saharan Africa Transport Programme/Road Maintenance Initiative (SSATP/RMI), which was designed and sponsored by the World Bank with the cooperation of the United Nations Economic Commission for Africa (ECA). It describes the scope of the programme, the activities envisaged for its implementation and the level of participation and commitment required from participating countries.

The third section describes the series of video-training aids developed by the International Road Federation for the training of highway and public-works personnel. This series was not developed solely for use in Africa. It is applicable to any developed or developing country. However, it is described in this issue of the Bulletin because training is one of the areas that will be given priority during the present decade.

The training series is made up of 45 modules covering three areas: (i) road maintenance, (ii) road equipment maintenance and (iii) road and bridge construction inspection.

I. AN AFRICAN ROAD PROGRAMME FOR THE 1990s

A. Present situation and objectives

The last two decades have witnessed important progress in the transport sector. Numerous roads, port facilities, airports and railways have been constructed. Efforts also have been made to adopt or harmonize transport rules and regulations in every sector - air, land and maritime transport. Although the overall situation is now much better than in the early 1960s, when most African countries gained political independence, it is still far from satisfactory. Vast tracts of agricultural land remain isolated and in need of feeder roads for their development. Many of the roads built since the 1960s have deteriorated or are rapidly deteriorating through lack of adequate maintenance. Major road links between African countries and between land-locked States and maritime ports have not been constructed.

The objectives and priorities of the programme for the United Nations Transport and Communications Decade in Africa, which was proclaimed by the General Assembly on 19 December 1977 and endorsed by the African Heads of State in the Lagos Plan of Action in 1980, were very ambitious. They guided the work of the United Nations during the 1980s.

Those objectives were:

(a) To promote the integration of transport and communications infrastructures with a view to increasing intra-African trade;

(b) To ensure coordination of the various transport systems in order to increase their efficiency;

(c) To open up the land-locked countries and isolated regions;

(d) To harmonize national regulations and reduce physical and non-physical barriers to a minimum in order to facilitate the movement of persons and goods;

(e) To stimulate the use of local, human and material resources, the standardization of networks and equipment, research and the dissemination of techniques adapted to the African context for building transport and communications infrastructures;

(f) To promote an African industry in the field of transport and communications equipment;

(g) To mobilize technical and financial resources during the Decade with a view to promoting the development and modernization of transport and communications infrastructures in Africa.

The programme for the Decade gave priority to (a) regional projects; (b) subregional projects; and (c) national projects with regional or subregional aspects. Projects for the least developed, land-locked, newly independent, island and front-line countries were given priority over projects of concern to other countries.

The programme for the Decade was designed to promote the integration of the economies and infrastructures of the African countries. Although it gave regional programmes precedence over national programmes, the countries of the region have so far favoured their own national projects. This was certainly the major obstacle to the implementation of the programme during the 1980s.

New objectives and priorities are needed for the next decade. A realistic policy that takes into account the difficult economic conditions of the last few years and the socio-economic priorities of the coming years should be defined. Intra-African trade has not progressed much and is still very low; it represents less than 5 per cent of Africa's international trade (4.4 per cent of its exports and 4.1 per cent of its imports). The North-South flow of trade with Europe, established before most of the African countries became independent, continues to dominate African trade (60.6 per cent of its exports and 53.9 per cent of its imports). There is no indication that the situation will change in the near future, despite the decision taken by the Conference of African Ministers of Trade in October 1985 to increase intra-African trade by 10 per cent of its world total by the end

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of 1995. As sad as it may be for their industrial development, African countries will certainly continue to export raw materials and agricultural products to industrialized countries and to import manufactured goods from them. As stated in Africa's Priority Programme for Economic Recovery 1986-1990, during the 1990s high priority should be given to agriculture and rural development in order to increase food production and improve social conditions for the majority of Africans.

The existing roads and railways of Africa, most of which were built long before the Transport Decade was launched, link the hinterland to maritime ports and carry the north-south trade. They will continue to play a major role in Africa's transport and to receive more attention from national authorities for some time to come. Under these circumstances, and given the scarcity of financial resources, the completion of the African Railway Master Plan and the construction of the trans-African highway network will certainly be delayed again for some time.

The highway network, which was supposed to cover the entire region, includes plans for the following nine highways (see table 1 and map):

1. The Mombasa-Lagos Highway is 6,275 km and runs through Kenya, Uganda, Zaire, the Central African Republic, Cameroon and Nigeria;

2. The Dakar-N'Djamena Trans-Saharan Highway is 4,633 km and runs through Senegal, Mali, Burkina Faso, Niger, Cameroon and Chad;

3. The Lagos-Nouakchott Highway is 4,767 km and runs through Nigeria, Benin, Togo, Ghana, Côte d'Ivoire, Liberia, Sierra Leone, Guinea, Guinea-Bissau, Gambia, Senegal and Mauritania;

4. The Cairo-Gaborone Highway is 9,150 km and runs through Egypt, the Sudan, Ethiopia, Kenya, the United Republic of Tanzania, Zambia and Botswana;

5. The Trans-Saharan Highway is 8,266 km and runs through Algeria, Mali, Niger, Nigeria and Tunisia;

6. The Tripoli-Windhoek Highway is 9,037 km and runs through the Libyan Arab Jamahiriya, Chad, the Central African Republic, the Congo, Zaire, Angola and Namibia;

7. The N'Djamena-Massawa Highway is 3,689 km and runs through Chad, the Sudan and Ethiopia;

8. The Nouakchott-Cairo Highway is 7,983 km and runs through Mauritania, Morocco, Algeria, Tunisia, the Libyan Arab Jamahiriya and Egypt;

9. The Beira-Lobito Highway is 3,385 km and runs through Mozambique, Zimbabwe, Zambia and Angola.

Table 1. Trans-African highway network: current status

Project	Road surface condition (kilometres) Bitumen	Gravel	Earth	Total	Countries covered
(a) Highways in progress					
1. Mombasa-Lagos	2 761	577	2 937	6 275	Kenya, Uganda, Zaire, Central African Republic, Cameroon, Nigeria
2. Dakar-N'Djamena	2 775	738	1 120	4 633	Senegal, Mali, Burkina Faso, Niger, Nigeria, Cameroon, Chad
3. Lagos-Nouakchott	3 139	920	708	4 767	Nigeria, Benin, Togo, Ghana, Côte d'Ivoire, Liberia, Sierra Leone, Guinea, Guinea-Bissau, Gambia, Senegal, Mauritania
4. Cairo-Gaborone	5 601	1 980	1 569	9 150	Egypt, Sudan, Ethiopia, Kenya, United Republic of Tanzania, Zambia, Botswana
5. Trans-Saharan	4 761	481	3 024	8 266	Algeria, Mali, Niger, Nigeria, Tunisia
Total (a)	19 037	4 696	9 358	33 091	
(b) Highways planned					
6. Tripoli-Windhoek	4 377	659	4 001	9 037	Libyan Arab Jamahiriya, Chad, Central African Republic, Congo, Zaire, Angola, Namibia
7. N'Djamena-Massawa	762	266	2 661	3 689	Chad, Sudan, Ethiopia
8. Nouakchott-Cairo	6 188	183	1 612	7 983	Mauritania, Morocco, Algeria, Tunisia, Libyan Arab Jamahiriya, Egypt
9. Beira-Lobito	2 314	558	513	3 385	Mozambique, Zimbabwe, Zambia, Angola
Total (b)	13 641	1 666	8 787	24 094	
TOTAL (a + b)	32 678	6 362	18 145	57 185	

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Table 1 (continued)

Project	Road surface condition (kilometres) Bitumen	Gravel	Earth	Total	Countries covered
(c) Feeder links to:					
1. Mombasa-Lagos	2 889	3 564	4 983	11 436	Burundi, Rwanda, Chad, Congo, Equatorial Guinea, Gabon, Sudan
2. Dakar-N'Djamena and Lagos-Nouakchott	5 757	3 386	3 096	12 239	Benin, Gambia, Ghana, Guinea, Guinea-Bissau, Côte d'Ivoire, Mali, Mauritania, Niger, Nigeria, Senegal, Togo, Burkina Faso
3. Cairo-Gaborone	8 472	3 083	4 652	16 207	Libyan Arab Jamahiriya, Djibouti, Somalia, Malawi, Mozambique, Swaziland, Rwanda, Burundi, Uganda
4 Trans-Saharan	190	--	1 201	1 391	Libyan Arab Jamahiriya
5. Tripoli-Windhoek	208	304	600	1 112	Botswana
6. Beira-Lobito	593	130	2 436	3 159	Zaire
Total (c)	18 109	10 467	16 968	45 544	
GRAND TOTAL	50 787	16 829	35 113	102 729	
Percentage	49	16	34	100	

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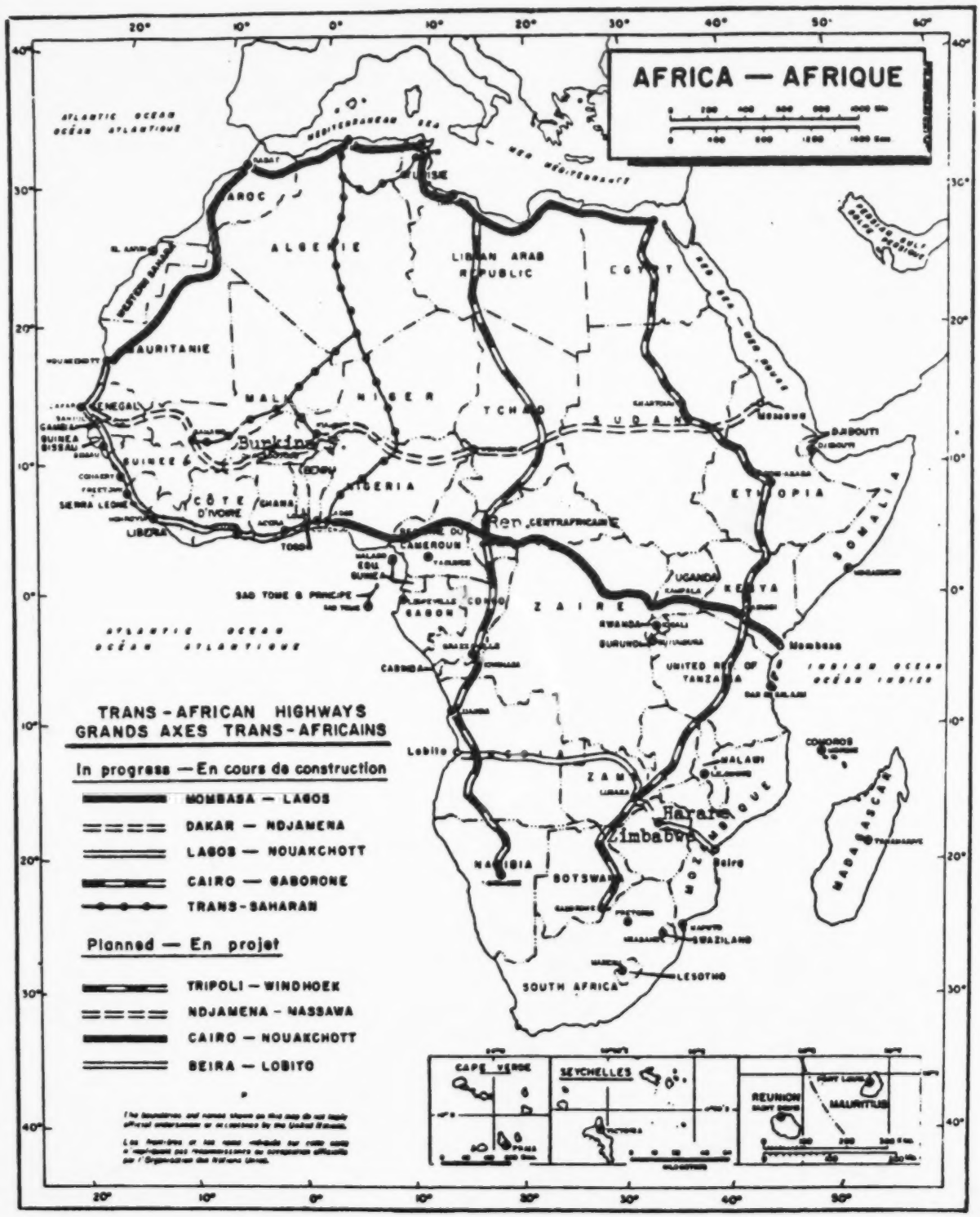
AFRICA — AFRIQUE
TRANS-AFRICAN HIGHWAYS
GRANDS AXES TRANS-AFRICAINS
In progress — En cours de construction
MOMBASA — LAGOS
DAKAR — NDJAMENA
LAGOS — NOUAKCHOTT
CAIRO — GABORONE
TRANS-SAHARAN
Planned — En projet
TRIPOLI — WINDHOEK
NDJAMENA — NASSAWA
CAIRO — NOUAKCHOTT
BEIRA — LOBITO
ATLANTIC OCEAN
OCÉAN ATLANTIQUE
INDIAN OCEAN
OCÉAN INDIEN
MEDITERRANEAN SEA
MER MÉDITERRANÉE
RED SEA
MER ROUGE
MOROCCO
ALGERIA
LIBYAN ARAB REPUBLIC
EGYPT
MAURITANIE
MALI
NIGER
TCHAD
SUDAN
SENEGAL
GUINEA
BISSAU
Burkina
NIGERIA
CÔTE D'IVOIRE
GHANA
SIERRA LEONE
LIBERIA
TOGO
CAMEROUN
Rep. CENTRAFRICAINE
ETHIOPIA
DJIBOUTI
SOMALIA
UGANDA
KENYA
SAO TOME & PRINCIPE
GABON
CONGO
ZAIRE
RWANDA
BURUNDI
Mombasa
UNITED REP. OF TANZANIA
CABINDA
Lobito
ZAMBIA
MALAWI
COMOROS
Harare
Zimbabwe
Beira
MOZAMBIQUE
MADAGASCAR
NAMIBIA
BOTSWANA
SWAZILAND
LESOTHO
SOUTH AFRICA
CAPE VERDE
SEYCHELLES
REUNION
MAURITIUS

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These projects were promoted on the assumption that the economies of the African countries will not only grow steadily but will move towards integration and that intra-African trade consequently will develop quickly. Unfortunately, that has not been the case, and the construction of the highway network has not progressed either; in fact, since their launching many of these projects have not received much financing from national Governments, donor countries or international organizations. It is estimated that at present 51,936 km of roads, at a cost of several billion dollars, must still be built in order to complete the highway network.

An alarming decline in financial in-flows has been experienced in recent years by all African countries. Their relatively large debts, combined with the difficult economic conditions prevailing in these countries, many of which have just emerged from the longest and most severe drought ever experienced in the region, the current world situation and the indications that the focus of the developed countries may be on the reconstruction of the economies of Eastern Europe, make it necessary for African Governments to revise the programmes and priorities established during the 1980s.

In the long run, construction of the trans-African highway network will certainly have economic and social justification, but under the financial and economic conditions now prevailing in Africa, and the world political environment, the completion of the highway network and the African Railway Master Plan should be given a lower priority, and a new set of policy measures and priorities should be defined and adopted.

B. New transport policies and programmes

Africa's Priority Programme for Economic Recovery 1986-1990, established and adopted at the twenty-first ordinary session of the Assembly of African Heads of State and Government (18-20 July 1985), has given the highest priority to food production and agricultural development. Despite the reference made in the Priority Programme to the financing of the Transport and Communications Decade in Africa, the emphasis placed on food production and agricultural development requires that new transport policies be defined. Such policies in the land transport sector should give priority to three major areas: (a) the preservation of existing transport infrastructure; (b) the development of an adequate network of rural feeder roads; and (c) the construction or rehabilitation of missing or deteriorated transport corridors between land-locked countries and maritime ports.

Maintenance, rehabilitation and preservation of existing road infrastructures

It is estimated that in 1985, Africa's road network represented a total of more than 1,895,300 km, with over 453,800 km of primary roads, over 432,750 km of secondary roads and over 618,200 km of tracks and rural roads (see table 2). Although a detailed assessment of the physical conditions of all the roads in every country of the region has not been made, it is estimated that over 680,000 km of road were paved in 1985 and that the

Table 2. National road networks in Africa, 1985

Country	Main roads (km)	Secondary roads (km)	Other roads (km)	Total (km)	Area (km^2)	Population (millions)
Algeria	30 000	22 000	50 000	102 000	2 381 741	20.1
Angola	..	..	..	60 000	1 246 700	6.8
Benin	3 500	5 000	--	8 500	112 622	3.7
Botswana	2 300	2 000	6 000	10 300	577 570	0.9
Burkina Faso	4 500	4 000	8 000	16 500	274 200	6.5
Burundi	1 000	1 500	5 000	7 500	27 832	4.3
Cameroon	2 900	8 000	18 000	28 900	475 442	8.9
Cape Verde	..	..	..	1 300	4 033	0.3
Central African Republic	4 400	6 300	11 300	22 000	622 984	2.4
Chad	2 000	8 000	15 000	25 000	1 284 000	4.4
Comoros	..	..	..	900	2 237	0.4
Congo	1 400	--	6 800	8 200	342 000	1.6
Côte d'Ivoire	7 000	6 000	33 000	46 000	322 462	8.8
Djibouti	800	800	--	1 600	21 700	0.4
Egypt	35 000	27 000	45 000	107 000	1 001 449	44.9
Equatorial Guinea	..	..	..	4 000	28 051	0.3
Ethiopia	11 500	--	25 500	37 000	1 221 900	31.5
Gabon	2 900	1 600	2 600	7 100	267 667	1.0
Gambia	500	1 800	--	2 350	11 295	0.6
Ghana	10 000	15 000	12 000	37 000	238 537	12.3
Guinea	3 500	8 500	17 000	29 000	245 857	5.2
Guinea-Bissau	2 000	2 000	1 000	5 000	36 125	0.8
Kenya	7 000	38 000	6 000	51 000	582 646	18.0
Lesotho	..	..	..	5 200	30 355	1.4
Liberia	2 000	2 500	4 500	9 000	111 369	1.9
Libyan Arab Jamahiriya	15 000	65 000	--	80 000	1 759 540	3.2
Madagascar	9 000	8 000	12 000	29 000	587 041	9.5
Malawi	3 500	2 500	7 000	13 000	118 484	6.5

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Table 2 (continued)

Country	Main roads (km)	Secondary roads (km)	Other roads (km)	Total (km)	Area (km^2)	Population (millions)
Mali	6 000	7 000	5 000	18 000	1 204 000	6.7
Mauritania	4 000	3 000	2 000	9 000	1 032 455	1.6
Mauritius	1 800	250	—	2 050	1 865	0.9
Morocco	8 200	6 000	35 000	49 200	607 000	22.3
Mozambique	..	..	..	35 000	784 961	12.2
Niger	7 200	6 500	23 500	37 200	1 267 000	5.7
Nigeria	30 000	20 000	70 000	120 000	923 768	84.0
Rwanda and Burundi	3 000	5 000	—	8 000	26 338	4.8
Senegal	4 000	6 000	5 000	15 000	196 192	5.8
Sierra Leone	3 000	4 000	—	7 000	71 740	3.7
Somalia	8 000	10 000	—	18 000	637 654	4.6
South Africa	150 000	20 000	30 000	200 000	1 221 037	30.0
Sudan	8 000	10 000	9 000	27 000	2 505 813	19.7
Swaziland	..	..	..	5 000	17 363	0.6
Togo	2 500	3 000	2 000	7 500	56 600	2.8
Tunisia	15 000	9 000	7 000	31 000	163 610	6.7
Uganda	6 900	17 700	—	24 600	236 036	13.7
United Republic of Tanzania	..	..	..	19 000	945 087	19.9
Zaire	21 000	37 800	77 000	135 800	2 345 409	30.0
Zambia	5 000	8 000	25 000	38 000	752 614	6.0
Zimbabwe	8 500	24 000	42 000	74 500	390 580	8.0
	453 800	432 750	618 200	1 895 300	29 211 592	496.3

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continent has invested some billions of dollars in its road network over the past 20 to 25 years. Although fewer railways were built during the same period, important investments have also been made in the rail sector, and several railway lines were built during this period (for example, in Gabon, Mauritania, Cameroon, Guinea, the United Republic of Tanzania and Zambia), bringing the total length of Africa's railway network (excluding the South African railway network) to an estimated 58,000 km.

Over the last 25 years, the development of transport infrastructure has consumed an important part of the budget of almost all African States and a large share of multilateral and bilateral assistance resources. For many countries, the transport sector absorbs about 15 to 20 per cent of all government expenditures. For example, World Bank loans and International Development Association (IDA) credits to sub-Africa's transport sector were respectively $US 2,225.4 million and $2,305.9 million in 1984 and $US 2,475.2 million and $US 2,466.0 million in 1985, totalling $4,531.3 million in 1984 and $4,941.2 million in 1985, with most of the financed projects being in the road and rail sectors. These amounts represented less than 50 per cent of the total costs of these financed projects during 1984 and 1985.

Unfortunately, a large portion of the infrastructure built during the 1960s and 1970s has not been properly preserved. Some roads have never been properly maintained; some are in such bad condition that they are passable only in the dry season. Therefore, one of the most urgent tasks for the next decade should be the rehabilitation of the existing infrastructure - the roads in particular - which would require a plan for major repairs and continuous maintenance. Road maintenance in Africa should include almost daily routine operations, particularly in tropical areas where the vegetation grows fast and tends to extend to the shoulders of a road and, together with the sand, obstructs lateral ditches and sometimes pipes and box culverts (see section III below). Maintenance should also include a yearly overall examination of the condition of the riding surface, the repair of potholes, the elimination or corrugations and a periodic examination of road structures, bridges and the like. The World Bank has estimated that the current backlog of road maintenance in sub-Saharan Africa will cost about $US 5 billion and that about $1.2 billion will be needed annually for routine and periodic maintenance to prevent further deterioration of the network.

Good maintenance depends on a good organizational structure. Within the public works ministry of each country there should be a department responsible for the maintenance and rehabilitation of the national road network. Such a department should be provided with qualified staff, adequate financial resources and the appropriate equipment. Similar provisions should also be made for the repair and maintenance of the railways.

The rapid deterioration of the road network has in part been caused by the condition of the vehicles and the failure to observe technical specifications such as vehicle weight, axle load and speed. The regulations on these matters should therefore be reviewed and strictly enforced.

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Development of rural infrastructures

Africa's Priority Programme for Economic Recovery 1986-1990 and the United Nations Programme of Action for African Economic Recovery and Development, 1986-1990, adopted by the General Assembly in 1986, give the highest priority at the national, subregional and regional levels, to the food and agriculture sector. The measures required for such development include the development and use of modern farm and processing machinery, increased use of fertilizers, improved seeds and pesticides, the establishment of remunerative product-pricing policies, the establishment of assistance programmes for small farmers (the vast majority of African farmers) and provision of the necessary inputs for increased yields, and an improvement in the distribution of agricultural products.

These objectives can only be achieved by ending the isolation of African farmers. Experience indicates that the lack of adequate feeder roads in rural areas is one of the major impediments to rural development and food production. All-weather feeder roads to farms and rural areas are therefore urgently required, and farmers must be assisted in organizing transport services to link villages, farms and local markets.

Rural feeder roads can be built and maintained in part by using local material and labour-intensive methods; villagers could be trained to perform some of the necessary tasks. Several African countries have adopted this approach. For example, the entire rural road network of northern Zaire was built and properly maintained for many years until the early 1970s by using locally trained personnel and labour-intensive techniques.

An evaluation of local needs should be undertaken immediately. A plan of action should then be prepared and implemented.

Links to land-locked countries

There are 13 land-locked developing countries in Africa (see table 3). Five of them - Botswana, Lesotho, Swaziland, Zimbabwe and Zambia - could have good physical access, by rail or road, to seaports through South Africa's road and railway network if it were not for the prevailing political situation in the subregion. Mali has relatively good access to the Atlantic Ocean through the 1,289 km Dakar-Niger railway (from Bamako to Dakar), which is in fairly good condition; it has also a "port franc" with berths and 36,196 square metres of warehousing at the port of Dakar. The other seven countries have less easy access to seaports through a combination of rail, road and water transport. The development of these countries is greatly hampered by the very long distances separating them from the sea and by the bureaucratic transit formalities that cause long delays and increase substantially the overall transport costs.

Table 3. Main access routes to the sea for the land-locked countries of Africa

Land-locked countries	Originating point	Transit		Distance (km)	Mode of transport
		Port	Country		
Botswana	Gaborone	Capetown	South Africa	1 400	Rail
	Gaborone	Maputo (via South Africa)	Mozambique	1 100	Rail
	Gaborone	Port Elizabeth	South Africa	1 200	Rail
	Gaborone	Durban	South Africa	1 100	Rail
Burundi	Bujumbura	Dar es Salaam	United Republic of Tanzania	1 455	Rail & water
	Bujumbura	Mombasa	Kenya	1 850	Road & rail
Central African Republic	Bangui	Pointe-Noire	Congo	1 815	Rail & water
	Bangui	Douala	Cameroon	1 400	Road & rail
Chad	N'Djamena	Lagos	Nigeria	2 000	Rail & road
	Moundou	Port Harcourt	Nigeria	1 750	Water & road
	N'Djamena	Douala	Cameroon	2 000	Rail & road
	Moundou	Douala	Cameroon	1 715	Rail & road
	Sarh	Douala	Cameroon	2 015	Rail & road
Lesotho	Maseru	Durban	South Africa	740	Rail
	Maseru	East London	South Africa	800	Rail
Malawi	Blantyre	Beira	Mozambique	560	Rail
	Blantyre	Nacala	Mozambique	700	Rail
Mali	Bamako	Dakar	Senegal	1 289	Rail & road
	Bamako	Abidjan	Côte d'Ivoire	1 250	Road & rail
	Bamako	Abidjan	Côte d'Ivoire through Burkina Faso	1 170	Road & rail
Niger	Niamey	Cotonou	Benin	1 060	Road & rail
	Zinder	Abidjan	Côte d'Ivoire	2 690	Road
	Niamey	Abidjan	Côte d'Ivoire	1 690	Road & rail
	Zinder	Cotonou	Benin	1 700	Road & rail
	Niamey	Lomé	Togo	1 225	Road
	Zinder	Lomé	Togo	2 250	Road
Rwanda	Kigali	Dar es Salaam	United Republic of Tanzania	1 750	Road, water & rail
	Kigali	Mombasa	Kenya	1 790	Road & rail

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Table 3 (continued)

Land-locked countries	Originating point	Transit		Distance (km)	Mode of transport
		Port	Country		
Swaziland	Mbabane	Maputo	Mozambique	220	Rail
	Mbabane	Durban	South Africa	500	Rail & road
Uganda	Kampala	Mombasa	Kenya	1 450	Rail & road
Burkina	Ouagadougou	Abidjan	Côte d'Ivoire	1 210	Road
Faso	Ouagadougou	Abidjan	Côte d'Ivoire	1 150	Rail
	Ouagadougou	Lomé	Togo	1 000	Road
	Ouagadougou	Tema	Ghana	900	Road
Zambia	Lusaka	Beira and Nacala	Mozambique (via Malawi)	2 570	Rail
	Lusaka	Dar es Salaam	United Republic of Tanzania	2 000	Road
Zimbabwe	Harare	Beira	Mozambique	700	Rail

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Two sets of measures are required to improve the transit transport of land-locked countries: (a) the development and maintenance of appropriate land transport corridors and (b) favourable transit customs and facilitation arrangements.

Infrastructure

The physical movement of goods from a land-locked country through one or more neighbouring transit countries raises the question of who is responsible for the construction and maintenance of infrastructure (roads, railways, port terminals, etc.), as well as for the operation of transport equipment and vehicles. Except for the southern African States whose transit routes pass through South Africa, the land-locked African countries are surrounded by countries that are not much better off than they are and also have inadequate transport infrastructure and equipment. Very often the transit countries are not ready to finance the construction and maintenance of transport facilities for the use of their land-locked neighbours, when these facilities will not profit them.

An effort should be made to find a satisfactory solution to this crucial problem. Appropriate arrangements could be worked out by which construction and maintenance costs would be shared by all the parties concerned. Experience indicates that financing organizations generally deal only with the countries in which projects are located, but it should be possible to overcome this obstacle by providing guarantees to both the transit and land-locked countries concerned. One example of what might be done is the Dakar-Niger railway, which handles a large share of Mali's foreign trade. It is operated by Senegal and Mali, and the two countries have formulated a customs agreement.

Transport facilitation

The facilitation measures for international movement of goods between countries encompass: (a) rules and regulations on technical specifications for vehicles (such as weight, dimension and axle load) and infrastructure (such as standards for roads, bridges and railroads), on road safety measures and on driving standards; and (b) customs and border-crossing formalities (such as customs inspection, customs bonds for transit, customs sealing and insurance arrangements), which generally involve the preparation and submission of numerous documents, complicate transit operations between countries, and increase delays at crossing points, the risks of damage and pilferage and direct and indirect transport costs.

The TIR* Convention, which was first adopted in January 1959 at Geneva and entered in force in January 1960, was revised in 1975 in order to take into account developments in the road transport industry. A second version, which entered into force on 20 March 1978, would certainly provide a solution to most of the facilitation issues facing the land-locked countries; but as of now, the African countries have not adhered to the Convention.

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* Transport international routier.

II. SUB-SAHARAN AFRICA TRANSPORT PROGRAMME

The economic effects of neglecting maintenance will always be borne by the road users in the form of increased vehicle operating costs, since it is 20-40 per cent more costly to transport goods on a poor road than on a good road. In the lifetime of a road, the accumulated vehicle operating costs can amount to 3 to 10 times the construction cost of the road. In the end, therefore, reducing expenditure on road maintenance will not serve the intended purpose of releasing resources for other activities. Instead, road users, who are mostly in the private sector, pay these costs, a high proportion of which require foreign exchange for spare parts, tires and replacement vehicles. A comparison of costs for preventive maintenance and rehabilitation made by the World Bank shows that when maintenance is neglected and rehabilitation becomes necessary, the cost per kilometre increases from 2.5 to 8 times the cost of regular maintenance. Therefore, by failing to redirect public spending to maintenance and constructing new roads instead, some African countries have been found to lose 3 to 4 kilometres of potentially good roads for every kilometre of new roads they construct.

These are the main reasons road transport prices in Africa are, on average, 2.5 to 3 times higher than in other regions of the world. This is in addition to markedly higher construction costs in Africa than elsewhere. Available statistics at the World Bank reveal that transport costs are more than 15 per cent of the prices of several African export commodities. The land-locked countries pay additional transit charges amounting to about 20 per cent of the value of goods transported, making many commodities less competitive in world markets. And who in the end pays the burden of high transport costs? Urban people certainly, but especially the already impoverished farmers in the interior.

Stopping the deterioration process and repairing damage already suffered will require serious government commitment and coordinated efforts by the international donor community. It will require changes in policy, improvements in institutions and management, good choices of technical options, and in some cases, an increase in the amounts of financial inputs to the road sector. In some cases the length of maintained networks may have to be reduced in order to direct available resources to road links with the highest social and economic priority.

An agenda for action has emerged from the experiences of Governments, proceedings of conferences and the experience of international lending agencies and bilateral donors. ECA has discussed road maintenance on a number of occasions during the past 10 to 15 years, including the Fourth African Highway Maintenance Conference in Harare (December 1987). One of the specific suggestions made at that conference was to present the road deterioration problem to the next African Transport Ministers Conference in Kinshasa to get endorsement of the initiatives made under the Sub-Saharan Africa Transport Programme. The World Bank, together with ECA, did that and the draft resolution was unanimously approved. It recommended:

(a) Review of budgetary mechanisms, including earmarking and creating road funds to reallocate sufficient funds for road maintenance and rehabilitation;

(b) Institutional strengthening of road agencies;

(c) Training and motivational initiatives to improve institutional performance and reduce staff turnover;

(d) Reliance on locally available resources, including appropriate and more labour-based technologies.

A. Objectives

The objectives of the SSATP/Road Maintenance Initiative for African policy makers and senior managers are:

(a) To increase awareness and reach common assessment of the magnitude of the road maintenance problem, and to increase motivation and commitment to address the problem by changing attitudes and behaviours;

(b) To identify appropriate technical, financial and organizational policy options and to develop policy action plans for specific road agencies and institutions;

(c) To support and monitor the implementation of national policy reform plans and assess the effectiveness of the plans carried out.

Through these initiatives it should also be possible to establish or strengthen regional institutions to assist countries in road maintenance policy making and planning. At the same time, the action-oriented Road Maintenance Initiative will improve cooperation and coordination among international lending institutions and bilateral aid donors.

B. Issues to be addressed

Addressing policy improvement and institutional reform is undoubtedly a priority. The following concerns are considered key to finding effective, long-term solutions and taking the appropriate steps to resolve the road maintenance and deterioration problem.

Institutional reform of road agencies

African policy makers should consider, if warranted, separating planning and supervisory functions from the execution of maintenance and construction works, and management policies to strengthen accountability at all staff levels for the use of resources and for performing tasks and reaching institutional objectives. Accountability may also have to be extended from

the managerial level to the political level and to road users. In countless instances, political and private interests have brought pressure on road authorities to divert resources intended for road maintenance. The effect in disrupting the maintenance mission of the road authority is the same, regardless of motives. The consequences of road neglect are a matter of public interest and as such they need to be made known to the general public and potential interest groups to stimulate the coalition of interests necessary to influence public policy.

It is significant to note that in all cases where there has been substantial success in establishing effective road maintenance institutions, there have been individuals in positions of responsibility who grasped both the importance of the maintenance function and the need for efficient use of resources. Without political commitment at some level, the maintenance function invariably suffers from neglect.

Budgetary mechanisms

Insufficient funding and delays in the release of funds remain a problem for road maintenance and rehabilitation. Reallocation of funds from new construction to rehabilitation and maintenance will be necessary in practically every country. This reallocation will not be easy given the mechanisms of the budgeting process. Nevertheless there is a need to seriously attempt such reallocations - if necessary, through reclassification of certain maintenance expenditures as capital expenditures. This will require the commitment of finance ministries, as well as road ministries.

Policy makers will have to consider such options as earmarked funds or road funds to ensure sufficient allocations of road-user revenues to road improvement. This puts a clear focus on road expenditure and offers a basis for better planning and accountability. A systematic analysis may be required to determine how much should be spent on roads. Some Governments may need to revise user charges or impose new ones which, if translated into better roads, can reduce rather than increase the cost to the public.

Technical options and economic consequences

Severe competing demands for resources require economic design of highways and maintenance programmes, taking into account not only the costs to government but also the much larger costs of vehicle ownership and operation borne by road users. Policy makers, particularly those under budget constraints, will have to compare the economic consequences of different maintenance options in the context of actual conditions in order to find the best network-level maintenance policies.

Human resources

There is scope for improved staff in several facets of road maintenance - from the substitution of unskilled labour for machinery to the Governments' difficulties in retaining competent managers, engineers, technicians, etc. -

giving rise to the demand for more effective manpower planning, training and development programmes to anticipate and meet needs. These plans should deal not only with the quantitative requirements of the training programme but with the qualitative aspects as well and should be based on analysis of the kinds of skills that need to be developed.

Local resources

The use of labour-based methods can be more cost-effective than equipment for many maintenance activities where wage rates are low. These methods are less dependent on foreign resources and for that reason are normally less susceptible to disruption. They create needed employment opportunities and increase self-reliance. Simple equipment, which can be made using locally based technologies, as well as the use of local materials in road pavements and structures, can also be considered.

Local contractors and consultants

There is also a need to identify appropriate policy reforms to enable effective participation of local civil contractors, plant repair shops, and consultants in executing many tasks presently undertaken, or attempted, by road agencies.

C. Project description

The Road Maintenance Initiative is envisaged as a five-year project, to be carried out in three phases.

Phase one consists of a series of policy seminars designed to bring African policy makers together to exchange experiences and views on the above-mentioned issues. The seminars are designed to:

(a) Increase their awareness of the magnitude of the road deterioration problem and reach a common assessment on this situation;

(b) Identify appropriate operational, financial, organizational or other policy options relevant and applicable to addressing and redressing the road deterioration problem;

(c) Give participants the opportunity to discuss and explore the relevance and applicability of these policy options to their own circumstances;

(d) Obtain, where possible, the commitment of policy makers to pursue these policy options, with external technical and/or financial assistance where required and requested;

(e) Increase participants' awareness of the support and commitment by the donor community to the pursuit of these policy options and concomitant investment programmes.

The focus of the phase one seminars of the Road Maintenance Initiative will be to assist a group of high-level policy makers in policy action planning so that they can discuss specific policy changes required in their countries to improve road maintenance, and let them develop a simplified action plan during the seminar, comprising a set of realistic policy reforms for their countries. In addition, the seminar is designed to develop commitment and attitudes. It is expected that there will be high-level officials in several participating country teams having the will to change policies. Without such a person inside the Government of a participating country, it will be difficult to bring about significant policy changes.

By the end of the first series of seminars it will be known which sub-Saharan countries have a realistic view of their need for changes in policy and how committed each delegation is to reforms.

In a second phase, follow-up workshops will be held for Governments willing to commit themselves to policy action plans. In preparation for these workshops, Governments will prepare detailed assessments of their road maintenance situations, including road inventories, manpower and financial resource projections, and reviews of plans in the roads sector. Technical assistance may be provided if requested to assist with these preparatory activities, which would include the following:

(a) Description and assessment of the highway organization;

(b) Identification (diagnosis) of specific problems;

(c) Definition of a certain number of policy reforms and priorities of decisions (action plans);

(d) A plan of implementation;

(e) Cost estimates.

It is hoped that at least a few countries will volunteer for phase two. Only one good demonstration project is enough to convince others. If too many countries give a positive response after the seminars, the World Bank will have to select those few countries where both the Bank and the sponsoring donor community feel there is a chance of success both in raising funds for phases two and three and in implementing policy reforms.

The detail and design of phase two has not been worked out yet, since it is expected to be country specific. Funding for this phase of the Road Maintenance Initiative is expected to come from the aid donors, in particular from the donors that support phase one, and/or donors supporting the transport sector in the volunteering countries.

Through a detailed country-specific diagnosis stage of phase two, the World Bank expects to tailor the design of the policy action planning workshops of that phase to the needs of particular countries. The number of

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such workshops has not been decided yet. The Bank is thinking in terms of either holding individual in-country workshops, or combining up to three countries in one initial larger exercise relying heavily on group interactions. The idea of establishing inter-ministerial committees to steer this work has also been proposed for particular countries.

In phase three, following the establishment of the action programmes, participating Governments will meet to discuss their experiences with the action plans in terms of progress and problems during implementation and remedial steps identified as necessary.

Phase three could include both implementation of the policy reform and activation of a physical programme of rehabilitation and preventive maintenance (resealing and regraveling) of roads. Coordinated external support for restoring the road networks would be handled by the operational divisions of development agencies, including the World Bank. The Sub-Saharan African Transport Programme would marshal support for region-wide mobilization of the resources needed for the restoration programme and would focus on the implementation of policy reform programmes. The Programme would continue to provide an opportunity for country interactions in assessing progress and comparing experiences in the implementation of the programme. Through the transport data component the Programme will also be able to follow up the introduction of new policies and provide some information about changes in efficiency and performance within the subsector of a particular country.

D. Phase one policy seminars

The Economic Development Institute of the World Bank is assisting the Programme in the design, preparation and presentation of the series of six seminars.

Participants

A series of six seminars will be designed for, and delivered to, all countries in sub-Saharan Africa. Each Government will be invited to send a team of officials from relevant ministries related to the planning, financing, budgeting and implementation of road maintenance and rehabilitation programmes. Because the seminars are aimed at exploring policy options and bringing about policy changes, dialogue will be conducted with ministers and top civil servants who work at the level of government where substantive policy reforms would be initiated. Accordingly, the country teams would be led by the minister responsible for the central roads department - normally the minister of public works or transport, depending on the organizational arrangements for each particular country. He would be accompanied by the chief engineer (roads) or roads director responsible also for maintenance and rehabilitation programmes. The country teams would include senior officials of the ministry of planning and of finance with direct responsibility for programming and budgeting of road expenditures. Country teams will consist of either three or four officials, depending on the country. Their specific

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composition will be discussed and agreed with the relevant World Bank country department prior to sending out the invitations to the prospective participants.

For practical and logistical reasons and to minimize costs, the series will be run in two groups - the first, consisting of three anglophone seminars, and the second, three francophone seminars.

Content and format

Each seminar will address three major topics. These have been divided into themes for the preparation of background papers with relevant case studies:

(a) Planning, financing and management for road maintenance and rehabilitation programmes, specifically:

(i) Planning, programming and budgeting;

(ii) Physical planning and management;

(iii) Financing and pricing;

(b) Operations and management of road maintenance and rehabilitation activities, specifically:

(iv) Equipment management;

(v) Appropriate use of available resources and technology;

(vi) Use of local contractors and consultants;

(c) Institutional reform and human resource development in relation to road maintenance and rehabilitation, specifically:

(vii) Institutional development;

(viii) Human resource development and management.

Each seminar will begin with a presentation of an introductory paper to describe the state of road maintenance and rehabilitation in the region and to highlight key issues and requirements to combat the road deterioration problem in physical and financial terms. The three above-mentioned topics will be presented and discussed. This will serve to identify the major policy issues and problems related to road maintenance and rehabilitation. The objective of the first part of the seminars will be to create positive awareness of the issues and problems and to change attitudes and build commitment to the policy changes needed to address the issues and problems.

The second part of the seminars will introduce and present instruments and approaches to policy action planning and give the individual country teams an opportunity to explore and apply policy action planning instruments and approaches to their particular situation and circumstances. Each team may present a report to the closing plenary session.

In addition to the participants, moderators, presenters, discussion leaders, resource people and seminar organizers will attend each seminar.

Collaborating institutions

As the associated agency, the ECA Transport Communication and Tourism Division will participate in all seminars. In addition, the seminars will benefit from collaboration with a number of agencies that fall generally under three headings: aid donors; technical assistance institutions and African regional and subregional organizations. By involving a number of regional and subregional organizations in various roles and capacities one will try to achieve two additional objectives:

(a) To obtain the commitment of these organizations through their participation in the seminar presentations and discussions on this matter of critical importance to Africa; and

(b) To make the participants of the seminar benefit from the knowledge and experience of these organizations in the area of policies and their impact on road deterioration.

A coordinating group of representatives from a number of organizations about once every six months to review and discuss the Road Maintenance Initiative.

Preparation

The preparatory activities for the seminars (conduct of a survey, not preparation of papers and case studies, action planning guidelines and country reviews) are in progress and are described below.

Survey of the road maintenance and road deterioration situation in each country and preparation of introductory papers. In 1987 and early 1988, questionnaires were sent to all countries in the region to gather information on road maintenance activities in each country, including data on the present condition of the road system, maintenance costs, physical accomplishments, and availability and use of resources. The returns formed the basis for a study on the state of road maintenance and rehabilitation in Africa and were used to prepare a policy paper on road deterioration in sub-Saharan Africa, which will be used for an introductory presentation at the seminars.

Preparation of policy issues papers that address the specific seminar topics, focusing on policies, policy options, policy actions and policy action planning. Emphasis will be given to ongoing policies and their contribution to the current state of the road systems and to optional alternative policies and their prospective roles in ameliorating the road deterioration problem. Case studies will illustrate actual African examples of situations where a policy action planning process has been adopted and implemented, preferably successfully. Each case study will be closely coordinated with the writing of the policy paper, and together they will constitute an important part of the presentations, leading to discussions on how to tackle problems through policy change.

Formulation of policy action planning guidelines, including examples. Guidelines will be prepared to help participants in the process of developing action plans for policy, institutional and other reforms and changes. The guidelines will highlight the effect of social and political concerns and pressures on maintenance policies.

Before arriving at the seminar, each country team will prepare a country review and analysis for its use and benefit in considering the relevance and applicability of policy options to be presented and reviewed at the seminars. The review and analysis will be in the form of a questionnaire, and will cover the statutory and administrative processes, procedures and constraints, including the various institutions and agencies involved and their respective roles, relating to the formulation, analysis, approval and implementation of policy changes in the areas described under the three main topics, as these relate to the issues of road maintenance and rehabilitation.

III. INTERNATIONAL ROAD FEDERATION VIDEOTAPE MAINTENANCE TRAINING LIBRARY

Road maintenance will be one of the main focuses for all African countries during the 1990s. Implementation of road maintenance programmes requires well-trained maintenance personnel, adequate equipment and well-tested maintenance procedures. In all these three areas, the majority of African countries are not sufficiently equipped and need assistance.

The International Road Federation, which was founded in 1948 to promote better road transportation systems world wide, with the financial assistance of the Ministry of Communications of Saudi Arabia, has developed a series of videotapes for promoting appropriate road maintenance throughout the world. These video tapes address two of the three requirements mentioned above, namely training of road and public works personnel and the dissemination of appropriate maintenance procedures.

The video series covers three vital subject areas: (i) road maintenance; (ii) maintenance and operation of equipment and (iii) road and bridge inspection during construction. The series contains 45 modules, each with its own video cassette. Each module presents a specific problem and, step by

step, demonstrates correct execution of the appropriate treatment. Because they can be used repeatedly for small or large groups, in training sessions or on the job, and can be combined to focus on specific areas, these video tapes are an efficient instrument for training or retraining road and public works personnel and for refresher courses. They discuss the appropriate materials, equipment and tools used in each maintenance activity. They promote the standardization of correct maintenance procedures and can lead to considerable savings in training and in maintenance operations.

Available in four of the official languages of the United Nations (Arabic, English, French and Spanish) and in three video formats (VHS, BETA and U-MATIC), as well as four television systems (NTSC, PAL, SECAM and PAL-M), the videotapes are already in use in 52 countries.

A. Road Maintenance Series

Each module in the Road Maintenance Series shows engineers, supervisors, and foremen how to perform specific maintenance tasks correctly and efficiently. A narrator explains each task as it is done. The tapes also show the appropriate materials, equipment and tools used in each maintenance activity. The objective is to teach proper maintenance and repair procedures so that roads will last longer and thus make the available funds go further.

Module 1. Common Maintenance Problems and Causes (21 minutes)

Common maintenance problems occurring on pavement surfaces, road bases and sub-bases, earth and gravel roads, shoulders, drainage facilities, bridges and roadside areas are presented clearly. The tape identifies the main causes of most road maintenance problems, giving the trainee an understanding of the importance of doing maintenance tasks correctly. It is a necessary supplement to all the other modules in the series.

Module 2. Traffic Control during Maintenance (versions 1 and 2) (24 minutes)

Protection of maintenance workers and equipment is the subject of this module. Basic principles for selection, placement, maintenance and removal of traffic control devices are demonstrated. Proper practice will keep traffic flowing smoothly during maintenance activities. Typical applications of traffic controls for maintenance works are shown step by step in real life situations. Version 1 uses European International Road Signs and is applicable to Europe, Africa and Asia. Version 2 uses Inter-American International Road Signs and is applicable to Latin America.

Module 3. Pothole Repair in Asphalt Concrete Pavement (13 minutes)

Potholes must be repaired quickly because they are a safety hazard. They damage vehicles and quickly lead to further, more serious road damage. Done correctly, the repair will last a long time. Done poorly, it can soon become a growing expense. Through a detailed nine-step procedure using proper

materials, tools and equipment, the tape demonstrates how to do each step correctly and efficiently, resulting in a long-lasting repair. Special emphasis is placed on the proper shaping of the repair and the compaction of the mix.

Module 4. Pothole Repair in Surface Treatment Pavement (14 minutes)

The correct procedures for use of granular material for filling potholes are demonstrated and explained. They will provide a long-lasting repair. Proper equipment and materials used for repair are also discussed. An eight-step procedure is demonstrated in detail. It includes (i) placing the traffic control devices; (ii) marking the damage area; (iii) cutting out and removing all damaged material; (iv) filling the hole with granular material; (v) compacting the granular material; (vi) sealing the surface with liquid asphalt and cover aggregate; (vii) cleaning the work site; and (viii) removing the traffic control devices.

Module 5. Crack Repair in Asphalt Pavement (12 minutes)

Repair procedures are shown for linear and alligator cracks from three to twelve millimetres wide. The correct work steps are described in detail. Proper hand tools and equipment designed to do the job best are shown. Materials for filling and sealing cracks are also presented. Actual repairs of linear cracks and area cracks are demonstrated.

Module 6. Repair of Depressions, Rutting and Corrugations (14 minutes)

The basic repair method for depressions, rutting and corrugations is to fill in the low areas with a levelling course of asphalt concrete and then to overlay the entire area with a wearing course. The proper procedures to perform this repair method with a motorgrader are described through eight work steps. Special considerations for placing and compacting each layer in a deep depression are illustrated. The tape also shows how to place and compact a thin overlay over the levelling course.

Module 7. Base and Sub-base Repair (16 minutes)

Details on correct procedures for the repair of base and sub-base are demonstrated in this videotape. Nine work steps include (i) placing the traffic control devices; (ii) marking the limits of the repair and cutting the pavement; (iii) removing all unsuitable material; (iv) installing the required sub-drainage; (v) restoring the sub-grade; (vi) replacing the sub-base and base; (vii) replacing the pavement surface; (viii) cleaning the work site; and (ix) removing the traffic control devices. Quick on-site tests of the moisture content of the sub-grade and base materials are also shown.

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Module 8. Single and Multiple Surface Treatments (15 minutes)

This module presents the what, the why, and the how in the construction of successful surface treatments on unpaved and paved roads. It covers good construction practices in eight detailed work steps. Preparing the surface to the treated, testing the asphalt distribution and checking the weather are discussed. Materials required for surface treatments are presented. Proper procedures for applying the asphalt, spreading the aggregate and compacting the aggregate are demonstrated. Construction of smooth transverse and longitudinal joints is also described.

Module 9. Slurry Seal (24 minutes)

This module describes an increasingly useful and cost-effective method of maintaining paved surfaces. It covers the resources needed to perform a slurry seal job, including materials, equipment and manpower. It also shows in detail the slurry seal operation in seven steps: (i) storage and loading of materials; (ii) traffic control; (iii) surface preparation; (iv) slurry application; (v) curing; (vi) rolling; and (vii) clean-up. Applying these procedures, the pavement will be protected with a uniform skid resistant and waterproof surface.

Module 10. Patching Unpaved Roads (12 minutes)

This is a manual method of maintenance for repairing such surface defects as potholes, ruts, gullies and soft spots on unpaved roads. The module describes an eight-step maintenance procedure to provide a long-lasting repair. Proper maintenance practices for preparing the hole, filling it with granular material and compacting the material are shown in detail. A quick test for moisture content of the material at the site is also described.

Module 11. Smoothing and Reshaping of Earth and Gravel Roads (21 minutes)

Regularly scheduled smoothing and reshaping will keep earth and gravel roads in good condition and reduce the need for major high-cost repairs. This videotape has two parts: (i) smoothing and (ii) reshaping. Each part includes a review of the equipment required, an overview of the work steps, a detailed presentation of the work steps and a summary of the work steps. Considerations for planning and preparing for the work are treated. Procedures for checking the road cross slope at straight and curved road sections are also presented.

Module 12. Re-gravelling (18 minutes)

A major maintenance operation to restore the wearing course of gravel roads is presented in detail. Necessary repairs of the road and drainage system before re-gravelling are discussed. Equipment, materials and procedures for re-gravelling are clearly described. The procedures include traffic control, reshaping and compacting the sub-grade, hauling and placing the granular material and compacting the granular material. Methods for

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checking the road cross slope and quick testing of the material's moisture content are also shown.

Module 13. Reshaping Earth and Gravel Shoulders (16 minutes)

This videotape shows the proper procedures for reshaping earth and gravel shoulders (without adding material) to correct shoulder drop-off, rutting, build-up of material and excessive weed growth and to maintain a safe shoulder with proper cross slope. A nine-step maintenance procedure is clearly presented step by step and the equipment and hand tools required are also discussed.

Module 14. Replenishing Earth and Gravel Shoulders (19 minutes)

Nine maintenance work steps to restore the unpaved shoulder by adding new material are shown in this module. Proper procedures are fully presented for preparing the existing shoulder surface before adding additional material, placing and spreading additional material and compacting the material. The equipment and material required to do the job best are discussed, as well as proper use of equipment.

Module 15. Mechanical Cleaning of Unlined Ditches (19 minutes)

Mechanical cleaning procedures with a motorgrader and with an excavator are presented. The tape reviews ditch structure and function and selection of the appropriate type of equipment to be used, depending on ditch design and condition. Proper work-step details include planning the job, traffic control, cleaning the ditch, cleaning adjacent culvert inlets and outlets and outfall ditches, disposing of unwanted material, cleaning up the job site and inspecting the finished job.

Module 16. Cleaning of Lined Ditches, Culverts and Catch Basins (16 minutes)

Proper procedures for manual cleaning of lined ditches, culverts and catch basins are demonstrated. The procedure includes traffic control, assigning the work, removing and disposing of all debris and obstructions, inspecting for damage, making minor repairs, cleaning up the work site. The tape also shows how to schedule the cleaning work.

Module 17. Cleaning and Clearing of Bridges (14 minutes)

This module describes why and how to clean all types of bridges and their components. It includes procedures for cleaning bridge decks, drainpipe, downspouts, expansion joints, and all signs and reflectors; removing unauthorized writing or painting; cleaning bearing assemblies, pier caps and abutments; and removing debris and waterway obstructions. Proper equipment and hand tools required to do the job are also presented.

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Module 18. Concrete Bridge Deck Repair (18 minutes)

Procedures for permanent repair of partial and full-depth bridge deck holes with cement concrete are detailed. Proper procedures and proper use of equipment and tools for cutting the concrete, cleaning out the hole and the reinforcing steel, building the form, preparing the concrete, and placing and finishing the concrete are shown and described. The correct method of curing concrete is also presented.

B. Equipment Maintenance and Operation Series

This series is for use in training equipment operators. The modules show and explain the correct daily maintenance and operations procedures for the major types of equipment in use on road work. The objective is to keep valuable equipment in good condition over a longer period and ensure efficient performance of road construction and maintenance jobs, making available funds go further.

Module 1. Operator Daily Maintenance of Motorgraders (20 minutes)

This module shows the operator the proper daily maintenance procedures which consist of four groups of activities: (i) the pre-start check; (ii) the warm-up check; (iii) the daily operating check; (iv) and the shut-down check. More important, it explains why these procedures are necessary and how to perform them correctly.

Module 2. Motorgrader Operation, Part I (22 minutes)

This module covers equipment instruments and controls; pre-operation checks; general operation tips; starting the engine; basic manoeuvres, including moving forward and backward, turning, braking and stopping; safety practices; and six basic steps to be followed in any job - study the job area, position the motorgrader, set the blade for the work to be done, set the gear, drive straight ahead and make as few blade changes as possible.

Module 3. Motorgrader Operation, Part II (21 minutes)

Operating procedures for the following motorgrader tasks are presented: grading a surface; mixing and windrowing; spreading; finish-grading, including both coarse and fine finishing; ditch cutting; backslope preparation; and ditch cleaning. Each activity is demonstrated in detail by the model operator.

Module 4. Articulated Motorgrader Operation (21 minutes)

The special controls and operating procedures for the articulated motorgrader are treated here. Procedures for V-ditch cleaning of both wet and dry ditches, for V-ditch cutting and for high bank-sloping are demonstrated step by step. Effective uses of the articulated motorgrader in difficult job conditions are also shown in detail.

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Module 5. Operator Daily Maintenance of Front-end Loaders (18 minutes)

Following these daily preventive maintenance procedures will provide efficient performance over a longer period and extend the service life of the front-end loader. The tape demonstrates in detail how to carry out correctly four groups of daily maintenance activities on the front-end loader and why these activities are necessary. It also covers procedures for cleaning a dirty air filter element if no new elements are available for replacement.

Module 6. Front-end Loader Operation, Part I (19 minutes)

Instruments and controls are shown and described. Basic uses of the front-end loader, safety procedures, general operating tips, pre-operation checks, how to start the engine, basic manoeuvres, including driving forward and backward, braking and stopping, and shutting down the engine are all treated in detail.

Module 7. Front-end Loader Operation, Part II (19 minutes)

More advanced tasks are demonstrated step by step. Operating procedures for efficient loading, stockpiling, digging, rough grading, hauling, demolition and forklifting are included. Two methods of loading material from a stockpile into a truck (the I-shape method and the Y-shape method) are shown. Standard stockpiling, ramp stockpiling and bin stockpiling procedures are described in detail.

Module 8. Operator Daily Maintenance of Crawler Tractors (19 minutes)

The operator is shown the general and proper procedures for daily maintenance of crawler tractors and is given an explanation why these procedures are necessary. All necessary daily preventive maintenance activities, from the start to the end of an operating day, are clearly performed by the model operator. Following these procedures will help to ensure that the crawler tractor is properly maintained and stays in good operating condition for the maximum time.

Module 9. Crawler-Tractor Operation, Part I (19 minutes)

This covers instruments and controls, important safety rules of operation, pre-operation checks, how to start the engine, how to operate the blade and its controls, how to use the ripper and basic manoeuvres, including moving forward, moving backward, turning and parking. All procedures are demonstrated in detail by the model operator and described by the narrator.

Module 10. Crawler-Tractor Operation, Part II (15 minutes)

The operator sees and hears step by step how to use the crawler-tractor effectively in bulldozing, stockpiling, ditching, cutting a roadway, finishing slopes, backfilling, removing stumps and rock, clearing land operations. Two

techniques of bulldozing, slot dozing and side-by-side dozing are demonstrated clearly. Towing and transporting a crawler-tractor are also discussed.

Module 11. Operator Daily Maintenance of Rollers (20 minutes)

The key to keeping rollers working at their best is to follow the daily maintenance procedures for rollers, including the steel-wheel rollers, pneumatic tire rollers and vibratory rollers presented in this videotape. The procedures cover all required daily maintenance activities on the rollers, beginning with the pre-start check, through the equipment warm-up check and the daily operations check to the shut-down activities at the end of the day.

Module 12. Roller Operation, Part I (16 minutes)

Trainees are given basic information on the major types of rollers, including static and vibratory rollers, steel wheel, sheepsfoot and pneumatic rollers and their uses, safety procedures, instruments and controls, general operating tips, pre-operation checks, starting the engine, basic manoeuvres and shutting down the engine.

Module 13. Roller Operation, Part II (19 minutes)

Rolling procedures for asphalt mix, soils, aggregate and gravel materials are demonstrated. Rolling phases, the rolling zone, rolling patterns, rolling techniques and vibration procedures are discussed in detail. Determining the best pattern for a rolling job and achieving maximum and uniform compaction while still keeping up with production are presented clearly. Techniques on rolling longitudinal joints and transverse joints are also included.

Module 14. Operator Daily Maintenance of Asphalt Distributors (15 minutes)

The module treats daily preventive maintenance requirements and procedures for asphalt distributors. Daily maintenance is required in four areas: the pre-start check, the warm-up check, the daily operating check and the shut-down check. The test of the distribution power system, the inspection and cleaning of the bitumeter, the test and adjustments of the spray bar and nozzles and procedures for cleaning out the asphalt distribution system are all presented and described.

Module 15. Asphalt Distributor Operation (30 minutes)

The module covers instruments and controls, safety practices, general operating tips, preparing the distributor for operation, filling the distributor from a supply source, heating the bitumen in the distributor, adjusting the spray bar and nozzles, and spraying operations. Operations procedures for spraying road lanes and shoulders are demonstrated. How to get a uniform spraying at desired spray rate is also discussed. Hand spraying, pump off and drawing materials in the bar back to the tank, and draining and flushing the circulating system, spray bar and tank are presented in detail.

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Module 16. Operator Daily Maintenance of Dump Trucks (18 minutes)

Step-by-step daily maintenance procedures on dump trucks include (i) the walk around pre-start inspection, which consists of checking tire pressure, looking for loose or worn parts, inspecting for fluid leaks, checking fluid levels, and draining fuel and air tanks of dirt and condensation; (ii) the warm-up check, which covers starting the engine, checking gauges, lights, the hydraulic hoist system and the steering system, and testing brakes; (iii) the daily operating check, which comprises listening for unusual noises, reading gauges frequently and being aware of any changes in a truck's performance; and (iv) the shut-down check requirements, which are filling the fuel tanks, cleaning the equipment, parking on a level surface, setting the parking brake, idling the engine and recording hour meter readings.

Module 17. Dump Truck Operation (24 minutes)

Trainees observe and hear explanation of instruments and controls, safety practices, operation tips, pre-operation checks, basic manoeuvres and procedures for shifting a typical 10-speed manual transmission. Starting, turning, stopping and backing procedures are clearly presented. Loading and dumping procedures, including single-pile dumping, spot dumping and spreading thin lifts are demonstrated.

Module 18. Driver Daily Maintenance of Light Vehicles (16 minutes)

The driver is shown how to perform proper daily preventive maintenance procedures on light vehicles, such as pick-ups and station wagons, and why these procedures are necessary. Detailed maintenance activities from the pre-start check to the shut-down check at the end of the day are demonstrated step by step.

C. Construction Inspection Series

The Construction Inspection Series is designed to train road construction inspectors. It focuses on the inspection of asphalt concrete paving, Portland cement concrete paving and structures construction. Field sampling and testing for asphalt concrete and cement concrete are also included. Expert inspection gives the essential assurance of getting what you are paying for - making the available funds go further.

Module 1. Asphalt Concrete Plant Inspection (25 minutes)

This videotape has five parts: (i) asphalt mixture, basic mixing process, basic operation of asphalt batch plants and basic operation of dryer drum plants; (ii) material controls for aggregates, admixtures and asphalt; (iii) inspection and controls for batch plants; (iv) inspection and controls for dryer drum plants; and (v) control procedures for asphalt mix.

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Module 2. Asphalt Concrete Paving Inspection (25 minutes)

This module has four parts: (i) the inspection of equipment and materials used for asphalt concrete paving; (ii) preparation for paving, including alignment control, grade control and weather limits; (iii) inspection procedures for the paving operation, for the delivery of the mix at the job site and for the construction of transverse and longitudinal joints; and (iv) inspection procedures for the compaction of the asphalt mix in each rolling phase.

Module 3. Field Sampling and Testing for Bituminous Construction (40 minutes)

The module comprises four parts: (i) bituminous mixtures; (ii) procedures for sampling of aggregates, asphalt and bituminous mixtures; (iii) field testing methods for aggregates, including the gradation test, sand equivalent test, crushed faces test and flakiness index test; and (iv) field testing methods for bituminous mixtures, including the particle coating test, extracting test, moisture content test, asphalt retention test, rice test (for determination of the maximum specific gravity of uncompacted mixtures) and Marshall test.

Module 4. Chip Seal, Prime, Flush and Tack Coat Inspection (18 minutes)

The module presents detailed procedures for these surface treatments, including inspection and controls for materials, equipment and construction.

Module 5. Inspecting Pavement Recycling (8 minutes)

Hot-mix plant recycling is covered, including the equipment and plant used for the operation, inspection procedures for pavement preparation, pavement removal, mixing of recycled and new materials and paving.

Module 6. Concrete Paving Inspection (20 minutes)

The module consists of: (i) inspection of the alignment and grade control, the sub-grade preparation, the setting of forms and the preparation of concrete and the lean concrete base; (ii) inspecting the placement and curing of concrete and paving with a slip-form paver; (iii) construction inspection of joints, and testing and accepting the finish pavement.

Module 7. Major Structures Inspection (56 minutes)

The module includes five parts: (i) bridge components; (ii) inspection procedures for bridge foundations, including pile and drift-shaft piling; (iii) inspection of piers and abutments; (iv) inspection procedures for bridge superstructures, including steel girders, pre-cast concrete I-beams, cast-in-place box girders; (v) inspection of bridge deck construction.

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Module 8. Incidental Concrete Structures Inspection (25 minutes)

The module has three parts: (i) introduction to incidental concrete structures, the inspection and controls for the plan, the excavation, forms and reinforcing bars; (ii) placement of concrete, including slip-form concrete placement and pre-cast concrete; (iii) construction inspection of joints, curing, removing the forms, finishing the surface (including class 1 and class 2 surfacing) and backfilling.

Module 9. Field Sampling and Testing for Concrete Construction (15 minutes)

The module has two parts: (i) introduction and description of concrete components and (ii) concrete sampling in the field and methods used for the slump test, air-content test and comprehensive strength test.

The videotapes have been supplied and are in use in Argentina, Australia, Austria, Bahrain, Bangladesh, Barbados, Bolivia, Brunei Darussalam, Brazil, Canada, Chile, China, Costa Rica, Cyprus, Denmark, Ecuador, Egypt, Ethiopia, Finland, Germany, Ghana, Guatemala, Iceland, India, Indonesia, Japan, Jordan, Kuwait, Lesotho, Malawi, Malaysia, Mexico, Myanmar, Netherlands, New Zealand, Oman, Pakistan, Portugal, Qatar, Saudi Arabia, Sierra Leone, Somalia, South Africa, Spain, Sri Lanka, Sudan, Taiwan Province of China, Thailand, Trinidad and Tobago, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland, United Republic of Tanzania, United States of America, Yemen and Zambia.

IV. CONCLUSION

Certainly a road system in Africa should be conceived as an instrument for economic development and for facilitating the movement of goods and persons throughout the region. It is also clear that this is an era of world-wide open competition in all economic areas, an era dominated by large economic ensembles. In many parts of the world, countries are taking steps aimed at putting together their economies or uniting. Recently, the Yemen Arab Republic and the People's Democratic Republic of Yemen formed a single state, the Republic of Yemen. In Europe, the Federal Republic of Germany and the Democratic Republic of Germany, separated since the end of the Second World War, have reunified and members of the European Economic Community will complete Western Europe's unification by 1992. These examples should be followed by Africa, for Africa will develop only if it pulls its resources and potentialities together and creates large economically viable entities able to generate jobs and money and to sustain economic and social development. These ideas have started to be echoed in Africa. During the last meeting between the French and African Presidents, some expressed the need for Africa to move towards forming larger economic ensembles.

The establishment and success of such regional/sub-regional groupings will require an adequate transport infrastructure. An international road network designed to support such entities will then be sufficiently justified

to attract international financing. The road transport priority programme described here, although it does not advocate building new additional highways, advocates preserving and improving existing infrastructure that will serve as the basis for the future African road network. It will allow the region to enter the twenty-first century with a set of good and practicable networks of national roads that can be progressively interconnected to link the various countries of the region.